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# MEASLES

SUPPLEMENT No. 148

TO THE

PUBLIC HEALTH REPORTS



FEDERAL SECURITY AGENCY  
UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1942

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# MEASLES

Prepared by the DIVISION OF SANITARY REPORTS AND STATISTICS, *United States Public Health Service*

Measles is the most widely prevalent and the most easily transmissible of all communicable diseases. Although it is likely that all persons at some time in life will have the disease, the practice of willfully exposing children to persons ill with measles should be discouraged.

The disease is particularly dangerous to infants and young children under the age of 3. According to the reports the largest number of deaths resulting from measles occur during the last half of the first year and during the second year of life. Deaths in children over the age of 5 are unusual.

An increase in the number of cases of measles is noted with the start of cold weather. In the United States the largest numbers of cases are reported during the months of March, April, and May. In all large cities the disease is present more or less constantly. Every 2 to 3 years it tends to become epidemic in thickly settled communities. The reason for this is that during this period new births build up another susceptible group.

The importance of measles is amply demonstrated in the accompanying table, which shows the number of cases reported for the entire country and the number of deaths resulting therefrom.

*Number of cases of measles, case rates, deaths, and death rates in the United States, 1920-40*

Year	Number of States reporting	Cases	Cases per 1,000 population	Deaths	Deaths per 100,000 population
1920.....	42	468,922	4.90	7,712	8.8
1921.....	46	282,074	2.77	3,790	4.3
1922.....	47	265,905	2.44	4,042	4.3
1923.....	48	761,267	6.88	10,450	10.7
1924.....	47	511,305	4.58	8,517	8.5
1925.....	47	225,027	2.01	2,404	2.3
1926.....	46	677,395	5.84	8,667	8.2
1927.....	46	441,349	3.76	4,433	4.1
1928.....	47	561,872	4.70	6,146	5.4
1929.....	48	366,056	3.01	2,923	2.5
1930.....	48	419,465	3.40	3,820	3.2
1931.....	47	474,878	3.82	3,576	3.0
1932.....	47	403,294	3.24	1,941	1.6
1933.....	48	400,894	3.18	2,813	2.2
1934.....	48	799,455	6.32	6,986	5.5
1935.....	45	743,856	5.83	3,907	3.1
1936.....	47	299,453	2.36	1,267	1.0
1937.....	48	321,510	2.48	1,501	1.2
1938.....	48	822,811	6.31	3,296	2.5
1939.....	47	403,317	3.08	1,174	0.9
1940 <sup>1</sup> .....	48	286,791	2.18	658	0.5

<sup>1</sup> Figures for 1940 are preliminary.

Deaths and death rates taken from Bureau of the Census publications.

It is noted that there has occurred a steady decline during recent years in the number of deaths from measles. The factors probably responsible for this are a recognition of the danger of the disease to children of preschool age, avoidance of needless exposure of small children, and adequate medical care.

#### **Cause of Measles**

Measles is caused by a "filterable virus." The infectious material is present in the secretions of the nose and throat, and the eyes. The virus is also present in the blood during the stage of the disease with fever.

#### **The Spread of Measles Infection**

A person may "catch" measles following exposure to a patient. Articles freshly soiled with secretions from the nose and throat of measles patients may be responsible for the transfer of the disease to a well individual. Since the virus lives for only a short time away from the patient, it is practically impossible for a third person to carry the measles infection from one building to another.

#### **Symptoms**

The first evidence of measles appears about 10 days following exposure to infection. The symptoms resemble those of the common cold—a running nose, red, watery, and puffy eyes, and coughing and fever.

Within the next 3 or 4 days, a rash appears, at first behind the ears and on the face, and spreading rapidly over the body. The spots are blotchy, dark red in color, slightly raised and irregular in outline, and last about 5 days.

A few days before the rash appears a doctor can detect measles by looking for "Koplik spots," named after the physician who discovered them. These spots are minute, bluish-white in color, and surrounded by a red zone. They appear at first on the inner lining of the cheek opposite the molar teeth.

As the rash comes to full development the fever also reaches its height; but, unless complications set in, it rapidly declines to normal. With the disappearance of the rash, there is a shedding of fine, branny scales for the next 5 or 10 days.

#### **Outcome**

The outcome of measles may depend upon the child's previous condition and resistance. The older the child, the more favorable are the chances of recovery.

Measles infection is often followed by severe and dangerous complications, such as bronchopneumonia, infection of the middle ear, infection of the glands of the neck, and laryngitis. Experience clearly indicates that prompt and adequate medical and nursing care lessens the development of complications and the number of deaths from measles.

#### Period of Contagion

As a general rule, measles may be considered actively contagious from the start of the first symptoms until 5 days after the appearance of the rash. After this period there is little danger of spreading the disease, provided there are no complications and no infectious discharges.

Schools should not be closed or classes discontinued because of the prevalence of measles. It is recommended that the children be observed daily by a physician or nurse for any signs of illness.

#### Disinfection

With measles, as with all communicable diseases, day-by-day disinfection is extremely important to prevent the spread of the disease. It is desirable to collect all discharges in paper tissues or clean rags and burn them promptly. All utensils used by the patient should be washed with hot soapy water and then boiled for 5 minutes.

The sick room should be thoroughly cleaned and aired for 48 hours, after which it may be considered safe for occupancy.

#### Prevention

One attack of measles usually protects a person for life from any subsequent infection.

The use of convalescent serum or immune globulin has proved effective in preventing or lessening the severity of the typical course of measles. After an attack of measles the blood is rich in protective bodies which are able to neutralize the virus of measles. For best results, it is important that this serum be given during the first 5 or 6 days after exposure to the disease. The protection is temporary, lasting between 2 and 4 weeks.

Immunization of infants and children under 3 years of age with convalescent serum in families where measles occurs in older children or adults should be encouraged.

There is as yet no generally accepted procedure of permanent protection against measles.

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GOOD  
TEETH



GOOD  
TEETH

FEDERAL SECURITY AGENCY  
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can be given some hard food, such as zwieback, to chew on. This will assist in the cutting of the teeth and is cleaner than a teething ring.

The jaws develop through usage. It is clear, therefore, that when sufficient teeth are present, food should be eaten which will require this usage. For this reason, the diet should include coarse materials which will exercise the jaws.

**GOOD TEETH**

By F. C. CADY, *Dental Surgeon*, and JOHN W. KNUTSON, *Passed Assistant Dental Surgeon, United States Public Health Service*

LOOK INTO the mouth of a baby. Apparently it is toothless; yet lying in the bone, under the gums, the first teeth are almost completely formed. And under these first teeth there are already the beginnings of the permanent teeth.

To grow strong and straight, those teeth must be properly built. They need the right kind of building material. In fact, they have needed it even earlier. The diet of the expectant mother has had much to do with the vigor of those teeth beneath the gums.

What kind of building material? What kind of foods will help those teeth grow?

The two most important things that build teeth are calcium and phosphorus; and for the growing child there is no better source of these important elements than milk. The diet of every child should include a large glass of milk with each meal. In addition to this, there should be other sources of mineral salts, such as fruits and green vegetables.

#### How Teeth Grow

AT ABOUT the sixth month (earlier in some, later in others), the first teeth, usually the lower front ones, will appear; and these will be followed at more or less regular intervals by the upper front teeth, then the back teeth, and lastly usually by the cuspids, or, as they are popularly called, the "eye" teeth. Teething in a healthy child is in itself a natural process. However, it is frequently associated with sore gums and excessive saliva. During this period care should be taken to keep the child's mouth clean. If the condition is severe, the physician or dentist should be consulted.

Every tooth, as it comes into place, marks another step in the child's development. At 6 to 8 months of age, the child

can be given some hard food, such as zwieback, to chew on. This will assist in the cutting of the teeth and is cleaner than a teething ring.

The jaws develop through usage. It is clear, therefore, that when sufficient teeth are present, food should be eaten which will require chewing. For this reason, the diet should include coarse materials which will exercise the jaws and scour the teeth, such as coarse whole-grained breads, hard tack, baked potatoes eaten with their jackets on, and fresh apples.

#### **The Baby (or "Milk") Teeth**

THE FIRST TEETH are often called "temporary" ("baby" or "milk") teeth. Some people think that because they do not remain their preservation is not of much consequence. Their presence in the mouth, up to the very moment their successors are ready to take their place, is essential. If they are lost too early, sufficient space may not be left for the permanent teeth to take their proper place. Sound baby teeth guarantee better preparation of food and better assimilation of that food for nourishment. This is vitally important in view of the fact that the child must eat and assimilate, in proportion to his weight, three times the food required by an adult.

Baby teeth are important teeth. They are teeth which are used during about one-fifth of the life span. They have a full and definite service, not merely a temporary one.

As early as possible, the child should acquire the habit of brushing its own teeth. A small brush and a small amount of pleasant tasting dentifrice can be used.

At the age of 3 or sooner, the parent should take the child to the dentist for careful examination. This should be a routine procedure at least every 6 months; thus, decay may be found before much harm has been done. In addition, this will restrict the dentist's services to easy and painless operations, so that the child will have no fear of dentistry.

#### **The First Permanent or "6-Year" Molar**

NO OTHER TEETH are like the first permanent, or, as they are often called, the "6-year" molars. There are four of these, one on each side of the upper and lower jaws, and they

are the first of the permanent teeth to make their appearance. They differ from the teeth that have thus far appeared in that they are larger, are not replaced by any other teeth, and do not replace others.

The first permanent molars play a very important part in the mouth, since they must sustain the stress of chewing during the period in which the temporary teeth are being replaced by the permanent teeth. They also largely determine the position of the permanent teeth which follow, and, therefore, the shape of the jaws and the later appearance of the child.

It is clear that the loss of such a molar, or the loss of its use through disease or bad position, may have serious results. Appearing, as it does, about the sixth year (giving it its name, "6-year molar"), it takes its place behind the temporary teeth without any interference and is often mistaken for one of the temporary teeth and is neglected upon the supposition that it will soon be lost or extracted anyway.

Be sure, therefore, to watch for the appearance of the "6-year molar"—the sixth tooth back counting from the front center—when it appears, care for it.

#### **Other Permanent Teeth**

AS THE SECOND teeth develop and begin to take their place, care should be taken that the first teeth are removed neither too early nor too late.

The permanent teeth, normally, will come up under the teeth they are to supplant. The roots of the temporary teeth will be gradually absorbed away before the advancing permanent teeth. Finally, nothing but the crowns will be left hanging to the gums to drop out in time of their own accord.

Sometimes, however, the permanent tooth may start to emerge either inside or outside the arch. The root of the temporary tooth then fails to be absorbed; it is an obstruction which must be removed before the second tooth has been forced out of line. Hence, special attention should be given to the teeth at this time. So important is this that the child should be under the repeated supervision of a competent dentist during this entire period. The following table gives

the approximate average time for the appearance of the baby and permanent teeth:

*Average time of appearance of the baby and the permanent teeth*

	Baby teeth	Permanent teeth
Central incisors (front teeth)	6 to 14 months	5 to 9 years
Lateral incisors (front teeth)	7 to 15 months	6 to 10 years
Canines (cuspids)	16 to 24 months	9 to 13 years
First bicuspids		8 to 12 years
Second bicuspids		9 to 13 years
First molars	12 to 20 months	5 to 8 years
Second molars	22 to 30 months	11 to 14 years
Third molars		17 to 21 years

<sup>1</sup> Children vary widely in the time their teeth erupt (appear), so that no particular concern should arise if a child's teeth appear late. As shown in the table, the difference in children may be 4 or even more years. Most children will erupt their teeth at about the average time between the earliest and latest years given for a particular tooth; for example, the central incisor appears from 5 to 9 years, but most children will erupt this tooth at the age of 7 years.

In general, the teeth of girls erupt from 3 to 6 months earlier than boys. Further, the lower teeth erupt earlier than the upper teeth, with the exception of the bicuspids, which erupt in the reverse order.

*Baby teeth.*—The same type of discussion applies to baby teeth, except that the span from the early eruptors to the late eruptors is about 8 months.

### Care of the Teeth

NINETEEN OUT OF twenty people at the age of 15 years have, or have had, dental caries.

Dental caries is the medical term for decayed teeth. The figures are from a recent United States Public Health Service survey of a typical town not far from Washington, D. C. They are the findings for school children. Perhaps, among grown-ups more than nineteen out of twenty persons have had one or more decayed or filled teeth.

That is a figure which makes one pause and think. It means that, except for the common cold, dental caries is the most prevalent of diseases.

One is impelled to ask, "Why do teeth decay? How can one prevent their decay?" Science cannot yet answer why. There is no magical formula which one can use which will prevent decay. For the present, at least, the best that can be done is to feed the expectant mother, the infant, and the child, tooth-building foods, and to visit the dentist early and often for the control of the extension of dental decay.

Decay of the teeth, spoken of as "dental caries," is caused by the action of germs (bacteria) which lodge upon the less exposed parts of a tooth. As a result of their growth, the tooth structure is softened and disintegrated.

Decay usually begins in one of two places. Sometimes it begins in the little grooves upon the surface used in chewing; sometimes it begins at the point where one tooth adjoins another.

### **Brushing the Teeth**

IF A PERSON ate only raw, hard foods, the scouring action of these foods would automatically keep the teeth and mouth clean and massage the gums. The teeth of most animals are kept clean and the gums healthy in this manner. The modern human being needs to brush the teeth daily to remove accumulations of soft and sticky foods. It may not prevent decay just as bathing may not prevent disease, but both are clearly habits which may reduce disease.

To brush the teeth properly, a person should have two toothbrushes, a fresh, dry one for each brushing. These brushes should be small so as to reach all surfaces of all teeth. The bristles should be widely spaced so that they can be forced between the teeth. Wide spacing of bristles also permits the brush to be easily cleaned. It is better to brush the teeth away from the gums and not toward them, otherwise food may be carried under the free margin of the gums. When the bristles become worn and soft, the brush should be replaced with a new one.

To accomplish its purpose, brushing of the teeth should be done after eating. Teeth should be brushed lengthwise. This permits the bristles to remove food from between the teeth and lessens the amount of wearing away of the enamel of the cheek and lip side of the teeth that sometimes happens when they are brushed crosswise.

### **Dentifrices**

TOOTH PASTES and powders are a good mechanical aid in the cleaning of the teeth. In choosing your dentrifice be sure it is not so abrasive that it will scratch the delicate enamel.

No safe dentrifices, however, will change the color of the teeth, either in one operation or over a period of time. No dentrifice will change the chemistry of the mouth from acid to alkali or vice versa. No dentrifice will cure bad breath, pyorrhea, or any other disease. No dentrifice will prevent dental decay. Tooth "bleaches" are not safe to use.

The Council on Dental Therapeutics of the American Dental Association has passed upon many commercially sold dentifrices. It accepts those which are harmless and which are honestly advertised. One may choose from its list both powders and pastes. Dentrifices which the Council accepts carry its seal of approval on their containers.

#### Conclusion

FROM WHAT has been said, it is apparent that the best tooth insurance is for the child and the adult to visit a competent dentist periodically, at least twice a year, for a thorough examination and necessary treatment. In this manner, diseased conditions of the mouth and teeth can usually be discovered, treated, and controlled in their early stages. There are no drugs which are safe and effective against such diseases. If neglected, tooth diseases will progress to a stage where permanent damage will result.



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SOCIAL SCIENCES



**WHAT  
EVERY PERSON  
SHOULD KNOW  
ABOUT  
MILK**



## Supplement No. 150 to the Public Health Reports

### WHAT EVERY PERSON SHOULD KNOW ABOUT MILK<sup>1</sup>

By LESLIE C. FRANK, *Senior Sanitary Engineer in Charge, Sanitation Section, Division of Public Health Methods, National Institute of Health, United States Public Health Service*

Of all things of life which affect human welfare none is more important than food. Food is to man what coal is to the furnace or gasoline to the automobile. Food furnishes man with internal heat, without which even overcoats would not keep him warm. Properly selected food provides mankind with the mental and physical energy which has been the mainspring of all civilization, it repairs the structural damage which the wear and tear of life inflict upon our bodies, and it helps make us resistant to disease. On the other hand, improperly selected food is responsible for a large proportion of human ills, from a simple stomachache to the shortening of life itself. In short, food is all-important in the human economy.

Of all the kinds of food none is more important than milk, the principal food of infants and small children. There are three important questions about milk which every person should be able to answer. They are:

(1) Why is milk such an excellent food, and how much of it should be included in the diet?

(2) How can milk be safeguarded to prevent it from transmitting disease?

(3) How can consumers be certain that the milk they drink has been thus safeguarded?

(1) *Why is milk such an excellent food, and how much of it should be included in the diet?*

In the first place milk is the only food specifically prepared by nature for the young of mammals. Nearly everyone will immediately agree that a substance specifically prepared by nature for no other purpose than for food is most likely to contain the food elements needed to sustain life and justly deserves the title recently conferred upon it, namely, "the most nearly perfect food."

It is by no means sure that we know all of the attributes which the perfect food should have, but we can at least discuss some of them.

<sup>1</sup> Supersedes Reprint No. 1659.

It will be obvious that one of the most important attributes which a food should possess is that it be a good source of energy, since every living thing needs a fresh supply of energy every day. Milk is such a food and, furthermore, is a cheap form of energy. The equivalent energy value in the form of certain other widely used foods is more expensive.

Milk is also a good muscle builder. It is rich in protein, which is required for muscle building. A child cannot grow and form strong muscles without protein. A full-grown adult cannot keep in health without it. A quart of milk yields more than an ounce of pure protein, that is, more than one-third of the total daily protein requirement of an adult.

Again, milk is a good tooth and bone builder, for it contains plenty of lime. Children particularly need lime, and the lime should be in a form which is easily utilized by the body. This is above all true of the lime in milk. One cup of milk contains as much lime as  $3\frac{1}{2}$  cups of carrots, 7 eggs, or 42 slices of bread.

Milk is a far more concentrated food from the standpoint of solids than most of us imagine. We think of milk as a liquid not much above the consistency of water; but it contains 13 percent of solids by weight, which is more than is contained in onions, beets, carrots, squash, pineapple, turnips, oysters, cabbage, radishes, cauliflower, spinach, watermelon, pumpkin, tomatoes, asparagus, celery, lettuce, or cucumbers. When we buy 1 pint or 1 pound of milk, therefore, we buy more actual dry solid food than when we buy 1 pound of any of these other foods.

Milk is also an excellent source of fat in the form of cream, which, with the milk sugar, is directly related to its fuel value.

Milk is an excellent source of vitamin A. Professor Sherman, of Columbia University, one of the outstanding diet specialists of the world, states that "milk is the most important of all foods as a source of vitamin A." The same author states, in his book on "Chemistry of Food and Nutrition": "Of the three vitamins A, B, and C, vitamin A is the factor of greatest practical importance to nutrition and health because so many of our staple foods are poor in vitamin A, and because a dietary poor in this vitamin causes such wide-spread weakening of the body and increases its susceptibility to so many infectious diseases."

In the January 1932 issue of the American Journal of Public Health, the work of Professor Mellenby and his wife on vitamin A (British Medical Journal, Oct. 3, 1931) was discussed. As a result of their work with 550 pregnant women, these authors reported a significant reduction in morbidity following the administration of a preparation containing vitamins A and D; and the authors conclude,

on the experimental evidence, that the vitamin-D fraction had little to do with the results.

Milk seems also to be a good source of vitamin G. This vitamin, as the result of the renowned work of the late Surg. Joseph Goldberger, of the Public Health Service, has been found to be valuable both in preventing and in curing pellagra, a dietary deficiency disease. Since milk contains vitamin G, the consumption of milk has been stressed by Goldberger and others as one important measure for combating pellagra.

Finally, milk is one of the most digestible of foods. It is easily and completely digested by most persons. Crumbine and Tobey state that the coefficient of digestibility of milk is from 97 to 98 percent.

It may be asked why milk was called "the most nearly perfect food" rather than "the perfect food." This is because, while it is the most nearly perfect food, it is not absolutely perfect, and what has been said would not be complete without reference to its shortcomings. Milk does not seem to be an entirely dependable source of certain vitamins, nor does it contain sufficient iron, and experiments have shown that infants and young animals restricted entirely to milk over considerable periods of time develop anemia.

For this reason, and also because variety in the diet stimulates the appetite, we should not try to live on milk alone. The diet of normal children should include a quart of milk daily, supplemented with a wise selection of other foods, among which should be included orange juice, cod-liver oil, and green vegetables. Normal adults may wisely include at least a pint of milk in their daily diet. Of course, abnormal adults or children should receive and follow competent medical advice.

It seems reasonable to believe that in the future public health officials will not always grade milk on the basis of its cleanliness and safety alone, but will also grade it with reference to its nutritive value. Recently it has become quite apparent that the kind of feed a cow gets affects the nutritive value of the milk she gives. Therefore it may be anticipated that some time in the future grade A milk may be required to have been produced by cows which receive at least a standard balanced ration so that their milk may possess the maximum food value for human beings.

(2) *How can milk be safeguarded to prevent it from transmitting disease?*

It seems a pity that milk can be such an excellent food and at the same time so dangerous if not properly safeguarded. But it is un-

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fortunately true that milk is not only a good food for human beings, but also a good food for certain types of disease organisms, such as those causing typhoid fever and diphtheria. Then, again, milk may sometimes, without our knowledge, come from sick cows. In such cases their milk may at the time of milking contain large numbers of the organisms of such diseases as septic sore throat, undulant fever, and tuberculosis.

Occasionally there occur milk-borne outbreaks of appalling magnitude. Only a few years ago a milk-borne outbreak in Montreal caused over 5,100 persons to be stricken with typhoid fever, and killed over 500 of them. Fortunately most disease outbreaks caused by unsafe milk are not nearly so serious as the Montreal outbreak, but the United States Public Health Service receives reports each year of from 30 to 50 outbreaks.

This fact is tremendously significant to all of us who drink milk—*and especially to all of us who have children.*

Among the diseases which may be transmitted through milk are tuberculosis, typhoid fever, scarlet fever, diphtheria, septic sore throat, and undulant fever. Let us confine ourselves for the moment to but three of them—tuberculosis, typhoid fever, and septic sore throat.

Suppose you were a dairyman. What would you do, short of pasteurization, to make sure that none of your customers would ever contract any of these diseases by drinking your milk?

Well, in the case of tuberculosis, almost the only thing you could do would be to have your cows tested for tuberculosis and kill those that showed they had it.

Suppose you did that. Suppose you had a herd of 50 splendid, pure-bred cattle, that you had them all tested, found 3 or 4 of them to be tuberculous, had these 3 or 4 slaughtered, and then continued with your business. Would you have protected your customers from contracting bovine tuberculosis? If I were one of your customers could you give me real assurance that I would never regret having permitted my children to drink the milk from your dairy?

Certainly the four you had slaughtered would no longer be a menace. But suppose that a year later, when you came to test again, you found another cow to be tuberculous. Then you would face a very serious question. You would wonder how many months it had been tuberculous. You would be assailed by the disturbing thought that perhaps some innocent child had received through your milk supply the germs of tuberculosis, an infection which might not disclose itself until considerable time had elapsed, until, perhaps, the child and the parents had forgotten that you had ever been their dairyman.

Do not let anyone benumb your conscience into believing that this does not happen. It does happen, again and again, even at certified and grade A raw-milk dairies, and slaughtering the infected cows does not undo the damage they have already done.

Now let us pass on to typhoid fever. If you were the owner of a raw-milk dairy, what would be the most effective thing you could do, short of pasteurization, to make sure that your milk supply would not carry typhoid fever to your customers?

Of course, if one of your milkers or other helpers contracted typhoid fever, you would at once have him quarantined or sent to a hospital; and if you were prompt and careful, there would probably be very little danger. But, unfortunately, that is not usually the way epidemics of typhoid fever are caused by milk. When milk becomes infected with typhoid fever it is usually not a sick person who is at fault, but, instead, a perfectly well individual, one who had had typhoid fever perhaps years ago and who possibly did not even know that what he had was typhoid fever. Nevertheless, he has, as a result of this possibly unrecognized sickness, become what is known as a typhoid carrier. Such a man is, so far as we know, a perfectly well individual. He doesn't look sick and he doesn't feel sick. But, unfortunately, he still carries typhoid fever germs, either in his gall bladder or elsewhere, from which they are discharged with his feces or urine, and thus accidentally now and then find their way to his hands, his clothing, and eventually to the dairy equipment and to the milk supply.

Of course, the typhoid-fever carrier is not aware of his condition. If he were, he would, in most cases, be honest enough to refuse to imperil the lives of his fellow beings by continuing to work at a dairy. But that is the dangerous thing about it. The typhoid carrier is usually ignorant of the fact that he is a menace, a carrier of disease and death.

Knowing these facts, then, what would you do if you were the owner of a raw-milk dairy? Possibly you would do what is required by the Public Health Service milk ordinance for grade A raw-milk employees who have at any previous time had typhoid fever. You would have everyone at your dairy send samples of their feces and urine to the health department laboratory so that it could be determined whether they contained any typhoid organisms. Fortunately scientists have discovered an excellent method of recognizing typhoid fever germs.

Now suppose you took this precaution and the laboratory reported that so far as it could determine none of the specimens of feces or urine contained the germs of typhoid fever. Could you then rest assured that none of your employees is a typhoid-fever carrier, and

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that none of your customers would ever contract typhoid fever from the milk you sold them?

Unfortunately, the answer must be no. Many typhoid-fever carriers do not discharge the typhoid-fever germs every day, and on the day the specimens were collected and sent to the laboratory the carrier, if there is one at your dairy, may or may not have been discharging the organisms. If he was discharging them, the chance that the laboratory would find them is excellent; but if he was not discharging them the laboratory could not, of course, find them.

There is, therefore, no way to make absolutely sure that raw milk will never contain the germs of typhoid fever; and if you knew as much about the danger as the health officer does, you, as a dairyman, would live constantly in fear lest some morning you awaken to find the newspapers pointing the finger of accusation at you and your milk supply.

We have now discussed 2 of the 3 diseases we intended to discuss.

How about the third—septic sore throat? What could you, if you were a producer of high-grade raw milk, do to prevent the transmission of this disease through your milk supply to your customers?

Frankly, I do not know. A milker may think he has an ordinary cold, when really he has septic sore throat. He may then infect the milk supply directly, or he may infect a cow's udder during the milking process, and the milk from that cow may later be simply teeming with the organisms of the disease.

Suppose we were to examine every milker's throat every day and every cow's udder every day. Even then we would not have done away with the danger, because by the time the report came back from the laboratory some of the milk would have been consumed. Of course, I need not tell you that a daily examination would be out of the question, if for no other reason than the expense entailed.

A septic sore throat outbreak can be very serious. In Portland, Oreg., some years ago, a milker infected a cow's udder; and before the resulting epidemic was quelled, 487 persons sickened and 22 died.

To repeat, I do not know of any way in which you could guarantee that septic sore throat would not be spread through your raw-milk supply.

It seems impossible, then, to escape the conclusion that all milk should be either pasteurized or boiled to make it safe.

Should we rely upon boiling? That is what is done in many parts of Europe and South America, and, as a result, they have in those places practically no milk-borne disease. But with these people boiling milk is a matter of daily habit. In most of the areas in question, the housewife does not have ice, and milk is boiled to keep it from souring.

In this country we have to deal with two factors: First, that most families do have ice or electric refrigerators and can keep milk sweet; and second, that many people do not like the taste of boiled milk.

If health officers simply said to all of the people, "Boil your milk," they could not depend upon a sufficient number doing it to prevent epidemics. Again, the adults and children who now drink raw milk because they like its flavor would not drink so much milk if it had to be boiled, and we must, by all means, encourage people to drink enough milk. It is just as important to do this as it is to make milk safe.

There is, then, only one other thing we can do (short of putting chemicals into the milk, and nobody wants to do that), and that is to pasteurize the milk. That is why most health authorities today feel that *all* milk should be pasteurized. The most common method of pasteurizing milk commercially is to heat it to 143° F. and hold it at that temperature for 30 minutes. This treatment kills or renders harmless all disease organisms which may be transmitted through milk. Higher temperatures for shorter periods are also effective.

You need not be worried about the effect of heating milk upon its food value. The vast majority of health officers and physicians today believe that pasteurizing milk has no significant effect upon its food value, especially when it is remembered that all children should receive a supplementary diet in addition to milk.

Several years ago the Public Health Service conducted an intensive study of about 3,700 children to determine whether those who drank heated milk actually thrived less well than those who drank raw milk. The results of the studies showed that the average weight of the children receiving raw milk was 33.2 pounds, whereas the average weight of the children receiving heated milk was 33.6 pounds; also the average height of the children receiving raw milk was 37.4 inches, whereas the average height of the children receiving heated milk was 37.5 inches. Furthermore, from the parents' reports it was found that the children who drank raw milk suffered with communicable diseases more frequently than did the children who drank heated milk only. The final conclusion of the study was that, taking into account the average supplementary American child diet, children who are fed pasteurized or other heated milk thrive as well as children who are fed raw milk, and contract certain communicable diseases less frequently.

"But," you may say, "many people do not like the flavor of pasteurized milk, and I am one of them."

That may be quite true; but it is true only when a low grade, unclean milk is used for pasteurization or when a high grade milk is improperly pasteurized. Pasteurization will not remove the bad flavor from bad milk, and even good milk can be damaged by pas-

teurizing it improperly. But if high grade milk is properly pasteurized, there is no change in the flavor. To prove this, your health officer may conduct the following demonstration:

He should satisfy himself that the local pasteurization plants are strictly observing the grade A requirements and that there is no real flavor difference, such as might result from the use of a higher pasteurizing temperature than is required or from exposure of the milk to copper. Then one of the local pasteurization plants may furnish both raw and pasteurized milk in quart bottles to the Rotary and other civic luncheons, the bottles being marked with distinguishing marks unknown to the drinkers. Each member should be provided with six glasses, placed in a row in front of him. A small portion of pasteurized milk should be placed in 3 of the glasses and a small portion of raw milk in the other 3 in an order unknown to anyone but the health officer. The members should not be told how many glasses contain pasteurized milk. Then each member should be asked to tell by tasting which of the six glasses contain pasteurized milk. (It is fundamentally important that the raw and pasteurized milk be identically the same milk, except for the fact of pasteurization. This condition is accomplished best by obtaining the raw milk directly from the pasteurizer just prior to the pasteurization process, after thorough mixing, and then obtaining the pasteurized milk from the same batch of milk.)

Each guest should be provided with a small card. The glasses should be considered as being numbered from left to right and each guest should be asked to write on the card the numbers representing the glasses containing pasteurized milk. Then someone from the speaker's table should announce the true content of each of the six glasses, and all of the members who guess correctly may be awarded a prize of some sort.

If pasteurization really imparted an undesirable flavor to milk, most of the guests should give correct answers for all six glasses. If pasteurized milk really cannot be detected by flavor, most of the members should fail in reporting all six glasses correctly. In tabulating the answers, each guest who fails to report all six glasses correctly should be listed as "wrong." A very few may guess correctly just by chance. This chance is the same as that of throwing all 6 heads when pitching 6 pennies at a time, usually not more than 1 or 2 times in 100 throws ( $p=0.0156$ ).

After this guessing contest has been tried upon at least 100 persons in the city, the results may be published in the newspapers as evidence of the fact that proper pasteurization really does not affect the flavor of milk.

Of course we should not rely upon pasteurization as a cure-all and neglect all precautions at the farm, even if the flavor problem did not exist. The pasteurization process is operated by human beings and therefore is not entirely foolproof, though it is nearly so. We should firmly insist that the milk we drink be not only properly pasteurized but also carefully produced, so that we will have the maximum practicable protection all along the line from the cow to the consumer.

(3) *How can consumers be certain that the milk they drink has been thus safeguarded?*

As above stated, milk which has been properly safeguarded must have been both carefully produced and properly pasteurized. Is the milk you buy such milk? The first thing you must know before you can be sure of this is whether the milk regulations in force in your city correctly prescribe the methods of production and pasteurization. There has been much disagreement on this point among health officers in the past, and obviously not all health officers have been correct. In some cities the milk is not carefully produced before pasteurization, and in others important pasteurization principles are ignored or faulty pasteurization machines used, and yet the milk may be sold as grade A or otherwise designated as safe.

To remedy this situation the Public Health Service has for a number of years been urging American States and cities to adopt one uniform system of effective control. The model uniform regulations are carefully reviewed annually by a National Advisory Board, composed of 16 experts in milk-control work.

Under the regulations approved by this board, grade A pasteurized milk is milk which has been both carefully produced and properly pasteurized and is as safe as any milk can be made. Grade A raw and certified milks are raw milks which are as safe as *any raw milk* can practicably be made. If you prefer to buy either of these raw grades, you can secure the added protection of pasteurization at home as follows: Heat the milk over a hot flame to 165° F., stirring constantly; then immediately place the vessel in cold water and continue stirring until cool.

If you buy grade A pasteurized milk, however, no additional home treatment is necessary.

About 875 American communities have already adopted these uniform milk regulations and are grading milk in accordance therewith. In such communities a milk distributor who is found to violate any grade A requirement is demoted or degraded by the health officer, and must remove the grade A caps and substitute lower grade caps, depending upon the nature of the violation. This attracts your

attention if your milk distributor becomes careless. Finally, the health officer may revoke the permit of such a distributor if he persists in failure to safeguard the milk he sells.

You may wish to know what you should do if your municipality has not as yet adopted these nationally recommended uniform milk regulations. The best thing to do is to call on your health officer and discuss the matter with him. In most cases he will appreciate that and welcome your assistance in urging the city authorities to adopt the ordinance and provide the necessary inspectors.

However, your health officer may have already worked out a good milk ordinance of his own and he may be justly proud of the results he has accomplished. If he is in doubt as to whether the local ordinance is in all respects the equivalent of the United States Public Health Service ordinance, he may consult the State milk-control authority or the Public Health Service. Even if your local milk ordinance is a good one, however, your health officer and you may agree that there are advantages of economy and efficiency in the adoption of a standard. There is no profit in difference for mere difference sake. Of course, if your local ordinance is really better than the nationally recommended standard, your city should not drop the improvements; but it should be made quite certain that they are real improvements. If so, they should be brought to the attention of the Public Health Service, which should incorporate them in its standard.

One final doubt may still assail you. You may want to know how you can be sure that the local milk inspectors do not give a dairy a grade A rating when it does not deserve it. This is a very real problem which is taken care of by another part of the general national milk sanitation program of the United States Public Health Service. It recommends that the State milk-control authority in each State should periodically measure the excellence of the milk sanitation work done in each municipality in the State by means of a rating method devised by the Public Health Service, and award ratings. If the city milk-control work is found to rate 90 percent or more, the name of that city is included in a list published periodically by the Public Health Service. A copy of this list may be secured by addressing the Public Health Service. You and your fellow milk consumers should leave no stone unturned in helping your health officer qualify your city for inclusion in this list.

Last of all, the Public Health Service itself occasionally rates cities in the various States and thus checks the State rating work. This gives you the assurance that the ratings awarded by the State department are comparable with similar ratings in other States.

## SUMMARY

(1) Milk is an excellent food because (a) it is a natural food, (b) it is a cheap source of energy, (c) it is a good muscle builder, (d) it is a good tooth and bone builder, (e) it is a highly concentrated food, (f) it is an excellent source of vitamins A and G, and (g) it is highly digestible.

Normal children should consume a quart of milk a day, normal adults a pint, together with a well-balanced supplementary diet, which in the case of children should include such foods as orange juice, cod liver oil, and green vegetables. Abnormal children or adults should receive and follow competent medical advice.

(2) By careful production and proper pasteurization milk may be safeguarded so as to prevent it from transmitting such diseases as tuberculosis, typhoid fever, scarlet fever, diphtheria, septic sore throat, and undulant fever. Neither production precautions alone nor pasteurization alone are adequate. Both are necessary to assure the maximum protection from cow to consumer.

(3) Consumers may assure themselves that the milk they drink has been thus properly safeguarded by purchasing only grade A pasteurized milk as defined by the United States Public Health Service milk ordinance, or by pasteurizing at home certified or grade A raw milk as defined by this ordinance. Consumers should ascertain whether the local milk ordinance is equivalent to the uniform milk ordinance recommended by the Public Health Service, and if not, they should offer to assist the local health officer in having all of its provisions incorporated in the local milk ordinance, or, better still, in having the present ordinance repealed and the recommended uniform ordinance adopted outright.

To insure that the ordinance is strictly enforced, the local milk-control work should be rated at least biennially by the State milk-control authority, and the rating should be not less than 90 percent, based upon the standard rating method recommended by the Public Health Service. Cities with 90 percent ratings are listed periodically by the United States Public Health Service. Copies of the list and of the recommended uniform milk ordinance may be secured by addressing the Public Health Service at Washington.

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FEDERAL SECURITY AGENCY  
UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*  
DIVISION OF PUBLIC HEALTH METHODS  
G. St. J. PERROTT, *Chief of Division*

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